Serial Device Server

CSE-H21 User's Manual

Version 1.7

2009-07-13

Sollae Systems Co., Ltd.

http://www.sollae.co.kr

To all residents of the European Union

Important environmental information about this product

This symbol on this unit or the package indicates that disposal of this unit after its lifecycle could harm the environment. Do not dispose of the unit as unsorted municipal waste; it should be brought to a specialized company for recycling. It is your responsibility to return this unit to your local recycling service. Respect your local environmental regulation. If in doubt, contact your local waste disposal authorities

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1 Overview

1.1 Overview

Along with the development of the Internet, the demand for data communication functions has increased recently. Data communication over the Internet requires using TCP/IP, the Internet communication protocol. That is to say, in order to connect a system to the Internet, TCP/IP protocol must be implemented. It is possible to implement TCP/IP by directly implementing the protocol, porting public TCP/IP, or using Operating System (OS). However, all these methods impose burdens on the developer in time, cost, and technology.

ezTCP series, a Serial ↔ TCP/IP protocol converter product group of Sollae Systems, enables you to use TCP/IP communication (the Internet communication) function simply by "connecting the cable to a serial port". ezTCP sends data from the serial port to the Internet network after TCP/IP processing, and vice versa.

CSE-H21 in ezTCP product group is a product that provides TCP/IP communication through Ethernet. In other words, like other ezTCP products, CSE-H21 sends data from the serial port to the LAN after TCP/IP processing and vice versa.

As CSE-H21 has 2 RS232 ports, it can be connected to two RS232 devices in the same time. And it is easy CSE-H21 to attach to user systems because of its compact size.

Because it has SSL and SSH function, user can communicate more safely. And it provides DHCP and PPPoE functions, so that it can be applied to the cable network and the xDSL network. And it has DDNS(Dynamic DNS) function, so it can be used more easily in the internet.

It can be operated wide range temperature condition and its serial ports are isolated electrically and there is surge protection function on the Ethernet port, so it is very suitable for noisy industrial environment.

It also provides debugging function, so user can solve the problem with ours.

1.2 Components

- CSE-H21 Body
- CD including utilities and documents (Option)
- 5V Power Adapter (Option)
- RS232 cable for PC connection (Option)

1.3 Specification

Power	Input Voltage	5V (±10%)
	Current	200mA typical
Dimension	158mm x 90mm x 24mm	
Weight	about 340g	
Interface	Serial	9 pin Dsub male
	Network	10/100 Base T (RJ45)
Serial Port	2 x RS232 (300bps ~ 230400bps, RTS/CTS Flowcontrol)	
Network	Ethernet 10/100 M bit auto-sense Auto MDI/MDIX	
Protocols	TCP, UDP, IP, ICMP, ARP, DHCP, PPPoE, DNS lookup, DDNS(Dynamic DNS) Telnet COM Port Control Option(RFC2217) SSL3.0/TLS1.0, SSH	
Diagnostic	Online Debugging Function	
RoHS	RoHS Compliant	
Approvals	MIC: SLS-CSE-H21 (A) CE: F690501/SP-EMY000088 FCC: F690501/RF-EMY002716	
Communication Mode	T2S	TCP Server Mode
	COD	TCP Client Mode
	ATC	TCP Server / Client (AT command emulation)
	U2S	UDP
Utilities	ezManager	Configuration utility via LAN
	Ezterm	Socket test utility
	Hotflash	Firmware download utility via TFTP
	ezVSP	Serial-TCP/IP virtual driver for Windows

☞ *You can download the firmware from our website (http://www.eztcp.com).*

1.4 Layout

1.4.1 Layout

There are an Ethernet port, two RS232 ports, and a Power socket on the top side. And there is an ISP switch on the right side. And 15 LED indicators are in the CSE-H21.

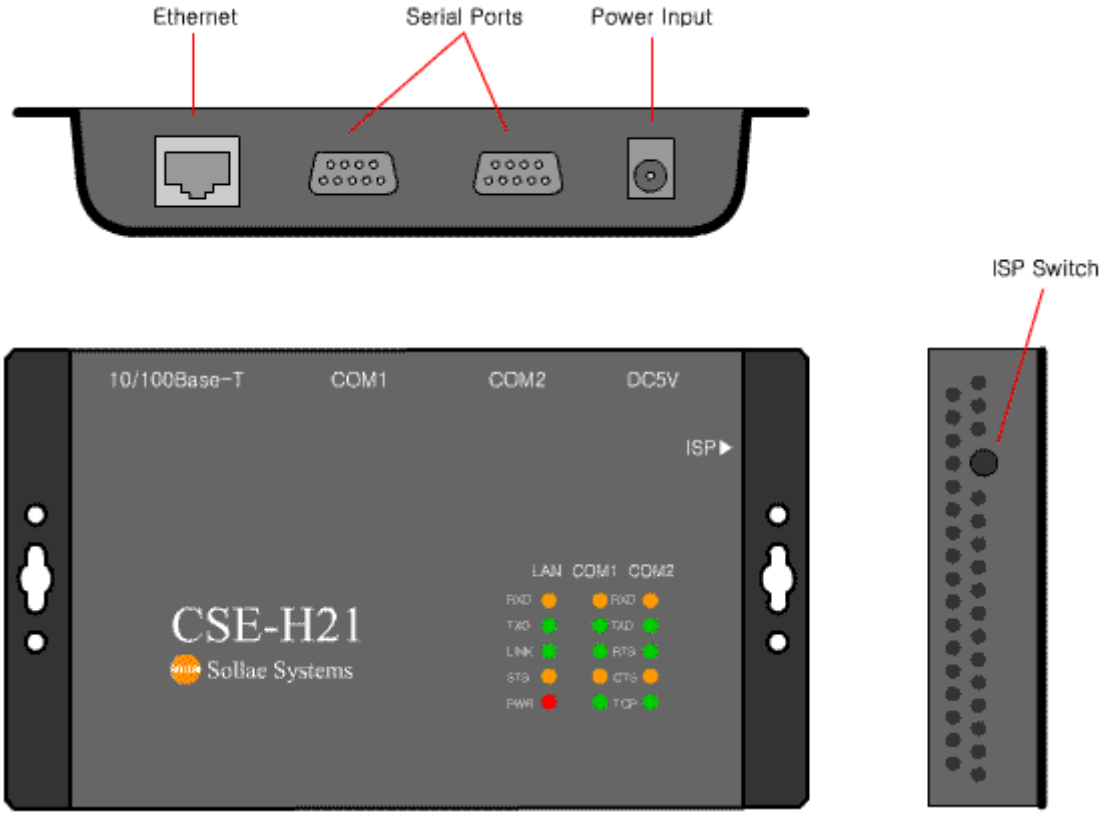


Figure 1-1 CSE-H21 Layout

1.4.2 LED indicators

There are 15 LED indicators on the CSE-H21. The left 5 are for LAN status, and the middle and right 5 are for COM1 and COM2 respectively. The followings are the operations of each LED indicators.

Table 1-1 LED indicators

Mode	Name		Color	LED Status	Description
Common	LAN	PWR	Red	On	Power is supplied.
		LINK	Green	On	CSE-H21 is connected to the Ethernet.
		RXD	Yellow	Blinks	Ethernet packet is received
		TXD	Green	Blinks	Ethernet packet is transmitted
	COM	RXD	Yellow	Blinks	serial data are received
		TXD	Green	Blinks	serial data are transmitted
		RTS	Green	On	There are enough rooms to receive serial data.
		CTS	Yellow	On	CTS signal from the counter-part serial device
Normal mode	LAN	STS	Yellow	Blinks in every second	IP address is assigned.
				Blinks 4 times /sec	IP address is net assigned in DHCP or PPPoE modes.
	COM	TCP	Green	On	TCP is connected
ISP mode	LAN	STS	Yellow	Off	CSE-H21 is in the ISP mode
Serial Configuration mode	LAN	RXD/ TXD/ STS	-	blink 2 times /sec at one time	CSE-H21 is in the Serial Configuration mode
	COM1	TCP	Green	On	A RS232 cable is connected for the serial configuration.

1.4.3 ISP Switch

There is an ISP switch on the side. If this switch is push 20ms~1s, it operates as Serial Configuration Mode. If this switch is push over 1 second, CSE-H21 operates as ISP mode. User can do firmware download to the CSE-H21 in the ISP mode. Please refer to 4.2 for more information on firmware download.

1.5 Interface

1.5.1 RS232 Port (DB9M)

There are two RS232 ports. The ports are interfaced with 9 pin D-sub male connectors. The serial ports are isolated electrically.

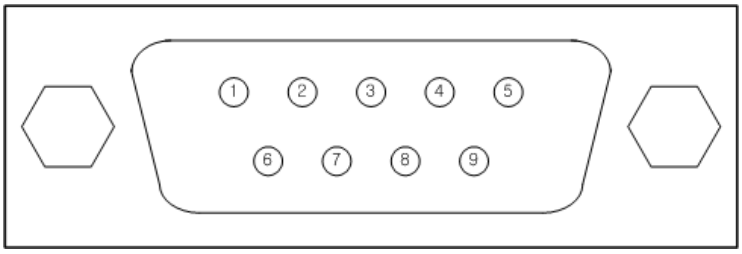


Figure 1-2 9 pin D-sub male connector

- RS232 ports

Table 1-2 RS232 Port Specification

Number	Name	Description	level	Dir.	Etc.
1	DCD	Data Carrier Detect	RS232	Input	optional
2	RXD	Receive Data	RS232	Input	mandatory
3	TXD	Transmit Data	RS232	Output	mandatory
4	DTR	Data Terminal Ready	RS232	Output	optional
5	GND	Ground	Ground	-	mandatory
6	DSR	Data Set Ready	RS232	Input	optional
7	RTS	Request To Send	RS232	Output	optional
8	CTS	Clear To Send	RS232	Input	optional
9	RI	Ring Indicator	RS232	Input	optional

- Data bits, Parity, Stop bit

Table 1-3 RS232 Parameters

Items	Parameters
Data bit	8, 7, 6, 5
Parity	None, Even, Odd, Mark, Space
Stop bit	1, 1.5, 2

- Flow Control

  CSE-H21 has RTS/CTS flow-control function.

- Telnet COM Port Control Option

  CSE-H21 has a Telnet COM Port Control function that is defined in the RFC2217. If this option is set, CSE-H21 transmits serial input signals (CTS, DSR) to the peer host and set the values (RTS, DTR, baud rate, data bits, parity, stop bit) onto its serial ports from the peer host.

- TX Delay

  CSE-H21 has a function that delays its serial data for the user's slow device. User can set the interval between byte and byte which are outputting from CSE-H21's serial ports. Its unit is byte.

1.5.2 Ethernet Interface

Network part of CSE-H21 is configured with Ethernet. So, what you have to do is only to connect UTP cable. The Ethernet part detects 10Mbit or 100Mbit Ethernet automatically, to connect the corresponding cable. It also provides auto MDI/MDIX function to detect 1:1 cable or cross-over cable automatically. Each piece of Ethernet equipment has unique hardware addresses, and CSE-H21also has factory-set hardware address (which is called MAC address)

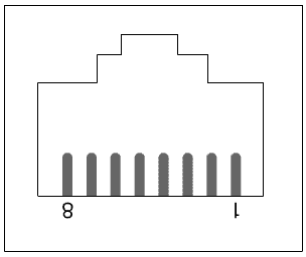


Figure 1-3 RJ45 Ethernet connector

Table 1-4 Ethernet port pin description

Number	Name	Direction
1	Tx+	Output
2	Tx-	Output
3	Rx+	Input
4	-	-
5	-	-
6	Rx-	Input
7	-	-
8	-	-

1.5.3 Power

DC5V is used for CSE-H21 and the specification is below:

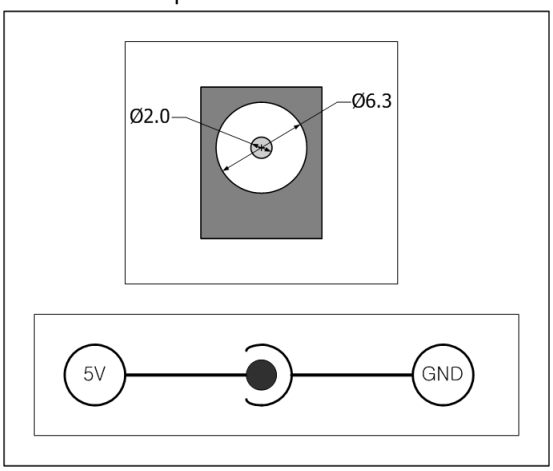


Figure 1-4 DC 5V Power Jack

2 Getting Start

2.1 Installation Method

You can install CSE-H21 in the following steps.

Table 2-1 CSE-H21 Installation steps

Title	Item	Sub-item
1. Checking the communication environment	Check items	IP address environment
		Serial port parameters
		Application program to be used
2. Connecting to the network	Check method	Check the LINK LED
3. Configuring the environmental parameters	Configuration method	Set by ezManager, a utility program for configuration through the network.
		Set by AT commands in ATC mode
	Configuration items	IP address related items
		Serial port related items
		Communication mode (depending on application program)
4. Application to the field		

2.1.1 Checking the Communication Environment

Before installing CSE-H21, check the network environment where CSE-H21 is to be installed, including the followings matters:

- IP address environment (local IP, subnet mask, gateway, DHCP/PPPoE etc.)
- Serial port type of the equipment to which CSE-H21 is going to be connected (RS232)
- Serial port items of the equipment to which CSE-H21 is going to be connected (baud rate, data bit, parity, stop bit, flow control)
- Application program protocol to be used (TCP/UDP, server/client, etc.)
- Security Function (SSL, SSH)

2.1.2 Connecting to the Network

Connect power to CSE-H21, and connect CSE-H21 either directly to the Ethernet port of the PC where test is to be performed or to the network (hub) to which the PC is connected.

2.1.3 Configuring the Environmental Variables

When network connection is completed, configure the environmental variables such as IP address related items, serial port related items, and communication mode related items through the LAN using "ezManager" the environmental variable configuration program.

2.2 Test Run

You can perform test run according to the following orders. The test run described here is based on the assumption that the IP address of the PC is set to 10.1.0.2.

2.2.1 Changing PC IP Address

You can change the IP address of your PC as follows:

IP Address	10.1.0.2
Subnet Mask	255.0.0.0
Gateway IP Address	-

2.2.2 Installing CSE-H21

Connect the supplied RS232 cable between your PC and CSE-H21, the LAN cable to the hub to which the PC is connected or directly to the PC, and the supplied CSE-H21 power adapter to CSE-H21 for power supply. If the LAN cable has been correctly connected when power is supplied, LINK LED turns on.

2.2.3 Configuring CSE-H21

Configure CSE-H21 setting using ezManager, the ezTCP configuration program, as follows.

Run ezManager, and click [Search All] button in the ezManager window. And, ezManager program will search all CSE-H21s on the local network.

When ezTCP is searched, MAC address of the ezTCP is displayed on the [Search Result]

window (The MAC address is indicated at the bottom of the product case).

Select the corresponding MAC address, and set the variables considering your network environment.

When no ezTCP is found, check the Windows firewall. If you press [Windows Firewall] button in the ezManager, you can see the Windows Firewall menu directly.

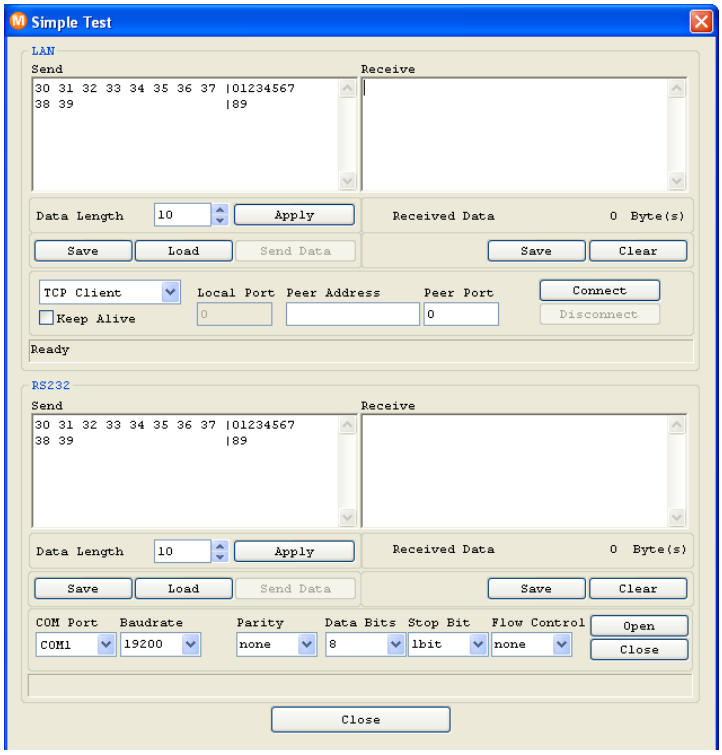
For simple test, we recommend that the variables keep default values as shown in the below table.

Parameter		Value
Network	Local IP Address	10.1.0.1
	Subnet Mask	255.0.0.0
Option	Telnet	Enabled
	IP Address Search	Enabled
Serial Port (COM1/2)	Serial Type	RS232
	Baud Rate	19200bps
	Parity	NONE
	Data Bits	8
	Stop Bit	1
	Flow	NONE
	Communication Mode	T2S – TCP Server
	Local Port	1470/1471

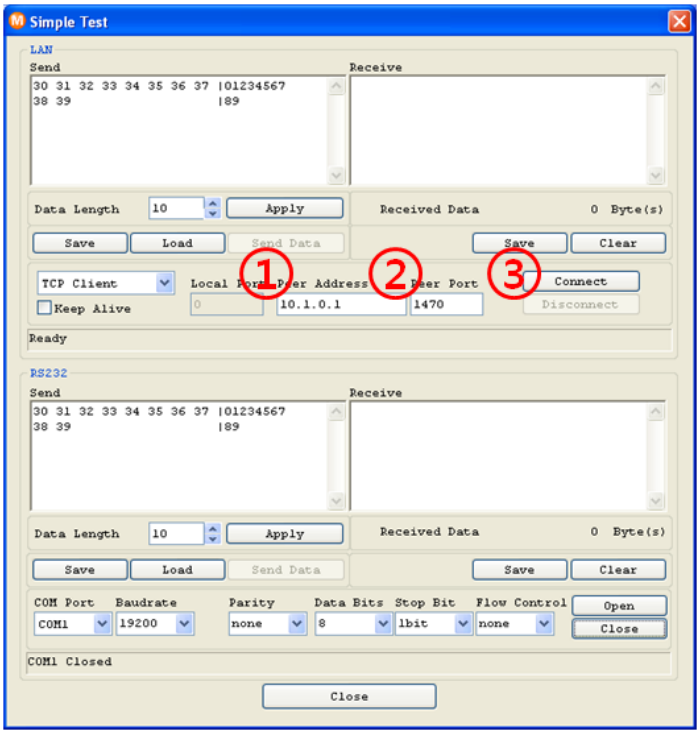
2.2.4 Communication Test

Power the CSE-H21 off and on, then it tries to connect to the LAN.

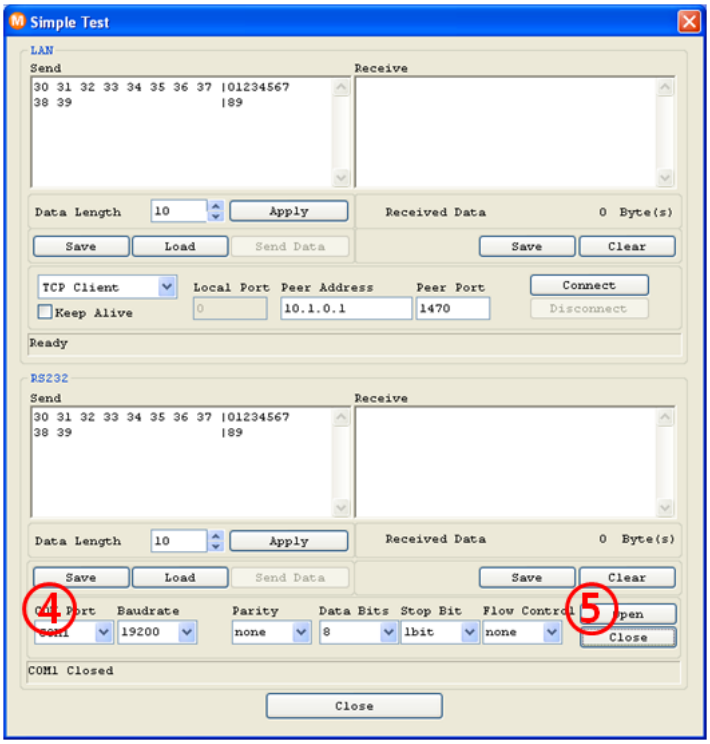
- A program for testing starts if you press the [Simple Test] button of the ezManager.



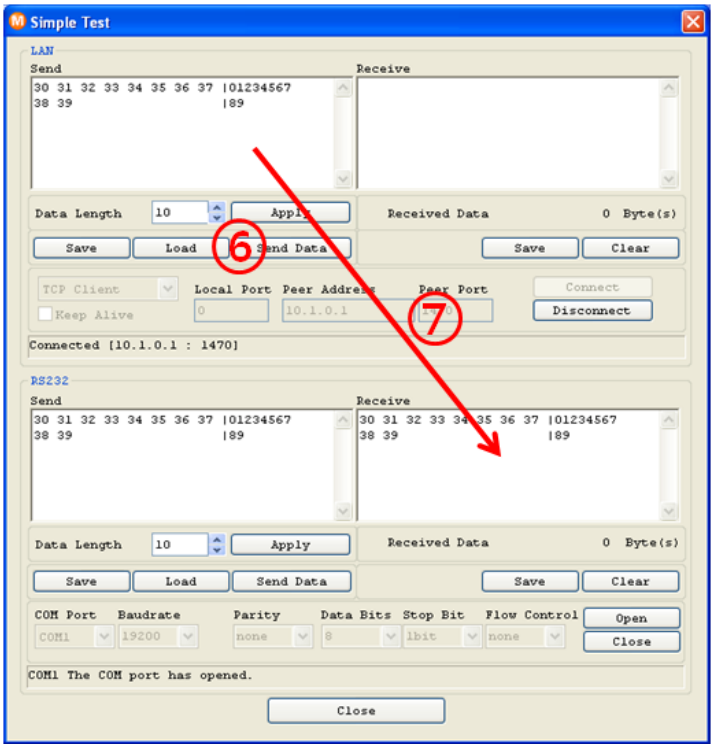
- Press the [Connect] button after inputting 10.1.0.1 and 1470 in the IP and Port. If the TCP connection is established there will be "Connected [10.1.0.1 : 1470]. And the STS indicator will be on.



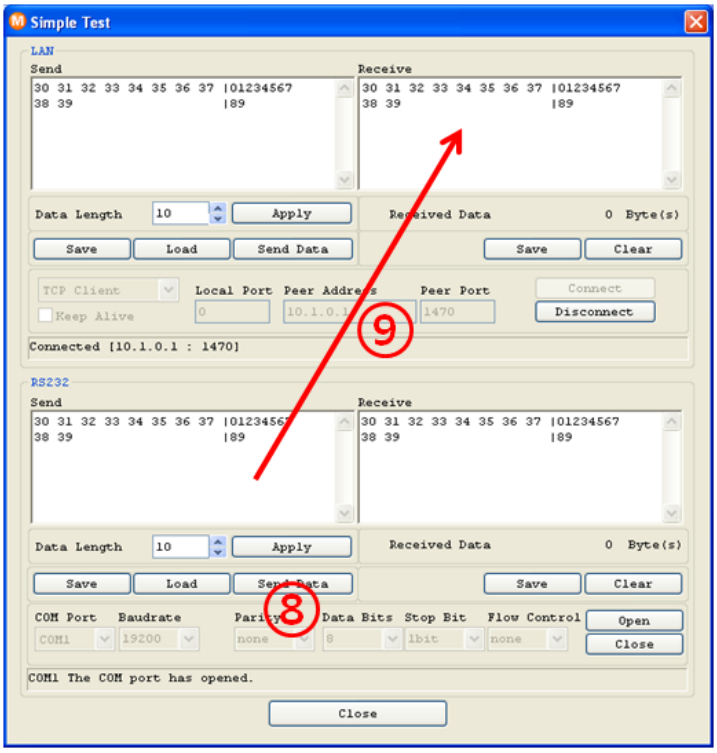
- Press the [Open] button after selecting serial port that is connected to the CSE-H21. If the serial port is open, the "COM1 the COM port has opened" message will be shown.



- If you press the [Send Data] button on the LAN part (Top), the data shown in the [Send] box will be transmitted to the [Receive] box on the RS232 part (Bottom).



- If you press the [Send Data] button on the RS232 part (Bottom), the data shown in the [Send] box will be transmitted to the [Receive] box on the LAN part.



- If the transmitting and receiving data are same, the communication test is successful.

3 Configuration

3.1 IP Address and Environmental Variables

For TCP/IP communication, you must set IP address related items. In addition, you have to set serial port related items (serial port type, communication speed, data bit length, parity bit, flow control, etc) to CSE-H21.

You can set the IP address and the serial port related items by using ezManager, the supplied configuration utility which allows you to configure your CSE-H21 over the network, or by using AT commands in ATC mode

3.2 Configuring with ezManager

3.2.1 ezManager

The basic environmental variables (IP address related items, serial port items, and etc.) can be set by ezManager which is an integrated management tool for Windows.

The ezManager is operated in Microsoft Windows(Windows 98, 98 SE, 2000 Pro, ME, XP Pro/Home, Vista). Following is the screen shot of ezManager which is just launched.

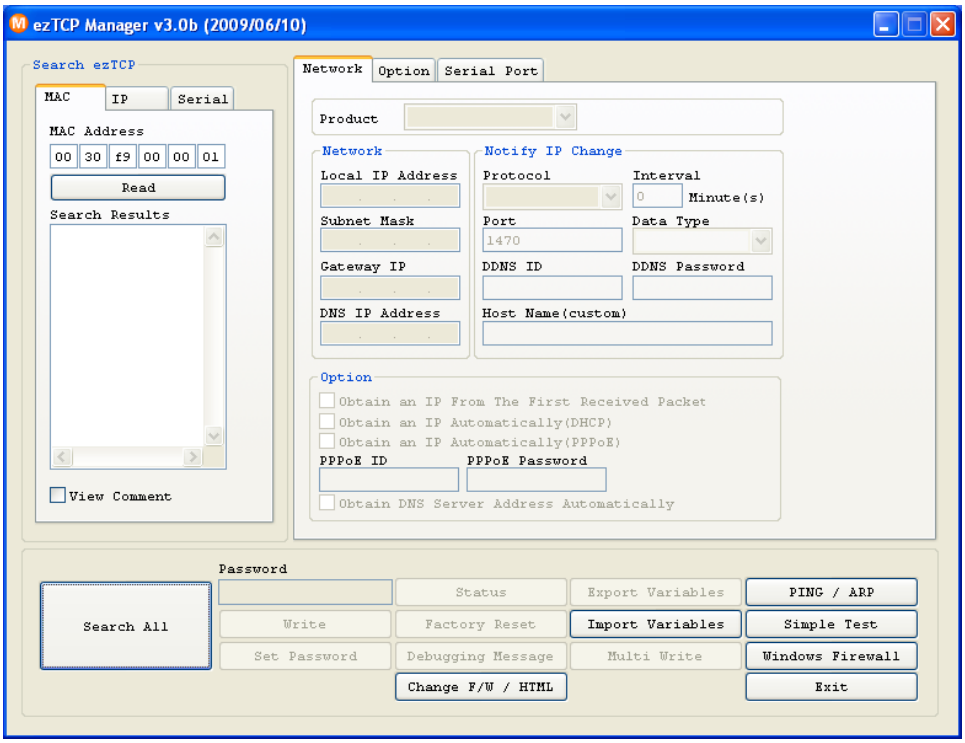


Figure 3-1 the initial window of the ezManager

3.2.2 Buttons of ezManager

Button	Description
Read	Read the values configured through MAC or IP address.
Write	Store the changed values of parameters
Set Password	Set or remove the password by this button.
Status	Check the status of ezTCP in real time.
Factory Reset	Initialize all the values as a default.
Debugging Message	Make the ezTCP broadcast debugging messages.
Change F/W / HTML	Change the firmware or HTML files with this button.
Export Variables	Store a set of values as a file.
Import Variables	Load values from a file made from [Export Variables]
Multi Write	Configure a set of values to one or more ezTCP
PING/ARP	Test the PING reply and manage the ARP table.
Simple Test	Run the test program interfaced with Network and RS232 port.
Windows Firewall	Run the windows firewall set window.
Exit	Exit ezManager

3.2.3 Parameters of ezManager

Tap	Section	Parameters
Network	Network	Local IP Address, Subnet Mask, Gateway IP, DNS IP Address
	Notify IP Change	Protocol, Interval, Port, Data Type, DDNS ID, DDNS Password, Host Name(dyndns/custom)
	Option	Obtain an IP From The First Received Packet, Obtain an IP Automatically (DHCP), Obtain an IP Automatically (PPPoE), PPPoE ID, PPPoE Password, Obtain DNS Server Address Automatically
Option	Option	Telnet, IP Address Search, Send MAC Address, Debugging Message, SSL, SSH, Multiple Connection
	ezTCP Firewall	Allowed MAC Address, Allowed IP Range, IP Address, Network Mask, Apply To ezManager

Serial Port	Serial Port	Serial Type, TTL, Baud Rate, Parity, Data Bits, Stop Bit, Flow Control, DTR/DSR, TX Interval
	TCP/IP	Communication Mode, Peer Address, Peer Port, Local Port, Event Byte, Timeout, Data Frame

3.2.4 Matters to be attended to

ezManager can be used when you want to change your device's environment variables. In case of CSE-H21, two interfaces are supported and those are Ethernet and RS232 port.

- Using Ethernet Port

  For use ezManager through Ethernet, CSE-H21 should be connected with PC on networks. If they are located at the same network, [Search All], on the [MAC] tap, could be used with MAC address. If they are connected on Internet, [Read], on the [IP] tap, could be used.

- Using RS232 Port

  For use ezManager through RS232, not only the CSE-H21 should be connected to PC with RS232 cross cable but also has to be operated as serial configuration mode.

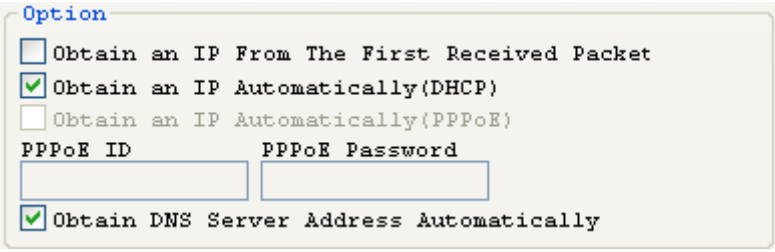
3.3 AT command

In ATC mode, the user can set environment variables through the serial port using AT command.

☞ *For more information, See "7. ATC Mode".*

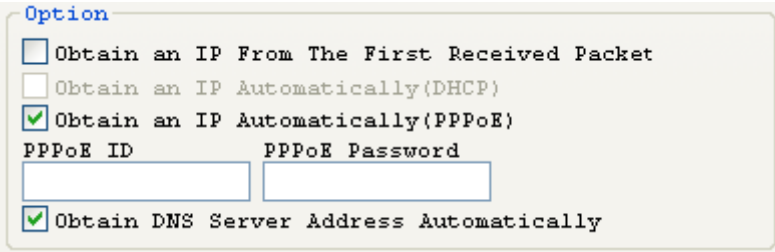
3.4 IP Address Related Categories Settings via DHCP

In the network environment composing DHCP server, settings related to CSE-H21's IP address, subnet mask, gateway, and name servers can be automatically designated using DHCP protocol. In order to do so, user must check [Obtain an IP Automatically (DHCP)] category on ezManager. Depending on DHCP server type, [Obtain an IP from the First Received Packet] category should also be checked as well.



3.5 IP Address settings via PPPoE

PPPoE is used in most ADSL and VDSL. To use PPPoE function, PPPoE function should be enabled and PPPoE ID and PPPoE password should be configured. The local IP address of CSE-H21 is assigned automatically in PPPoE environment.



☞ *Some ADSL or VDSL environment uses DHCP based on the modem type. Please contact your internet service provider for further information.*

3.6 Notify IP Change

In internet environment, most host get IP addresses dynamically. In this case, it is very hard to communicate to the host because the IP address is changed dynamically. The IP Change Trap service solves this problem. There are 3 types- DDNS, TCP and UDP- for this service.

3.6.1 DDNS (Dynamic Domain Name System)

If the CSE-H21 obtains its IP address, it notices to the service provider. Then the service provider serves DNS service. So, even though user doesn't know the CSE-H21's IP address, user can connect to the CSE-H21 by the host name (after DNS looking up.) The DDNS service provider that the CSE-H21 supports is only Dyndns (http://www.dyndns.com) currently.

3.6.2 TCP/UDP

In addition, CSE-H21 can transmit some information to user's TCP/UDP servers each

period which is set. This information is IP address, MAC address, product ID, firmware version, and comment. The data can be sent as either ASCII or Hexadecimal type.

☞ *For more details about the Notify IP Change, please refer to the document on our web site.*

☞ *For more details about the ezManager, please refer to the manual of ezManager on our web site.*

4 System Management

4.1 Operation Mode

CSE-H21 can operate in one of two modes (normal and ISP modes). Normal mode is ordinary data communication mode; and ISP mode is used to download CSE-H21 firmware through the Ethernet port.

4.1.1 Normal mode

The normal mode is an operation mode that CSE-H21's works for normal purposes. If CSE-H21 boots up without any other treatment, it works in the normal mode.

☞ *Please refer to the 5. Normal Mode.*

4.1.2 Serial Configuration Mode

If you press the switch on the side of the body in the normal mode for 20ms ~ 1s, it works in the Serial Configuration Mode. You can set the environmental variables through the COM1 port in this mode.

4.1.3 ISP Mode

If you press the switch on the side of the body in the normal mode over 1 second, it works in the ISP mode.

You can download new firmware to CSE-H21 with hotflash program that is a TFTP client through the Ethernet.

And you can configure the CSE-H21 in the ISP mode even though you forget its password or you can't access the CSE-H21 because the [Access Lock] function is enabled. (All security functions are disabled in the ISP mode)

4.1.4 Comparison between two modes

The following is a comparison between the normal mode and the ISP mode.

Table 4-1 Operation Mode

Mode	How to initiate	Description	Baudrate
normal	Power on CSE-H21 without pressing the ISP button	Normal data communication mode T2S, ATC, COD, U2S	the value that user set

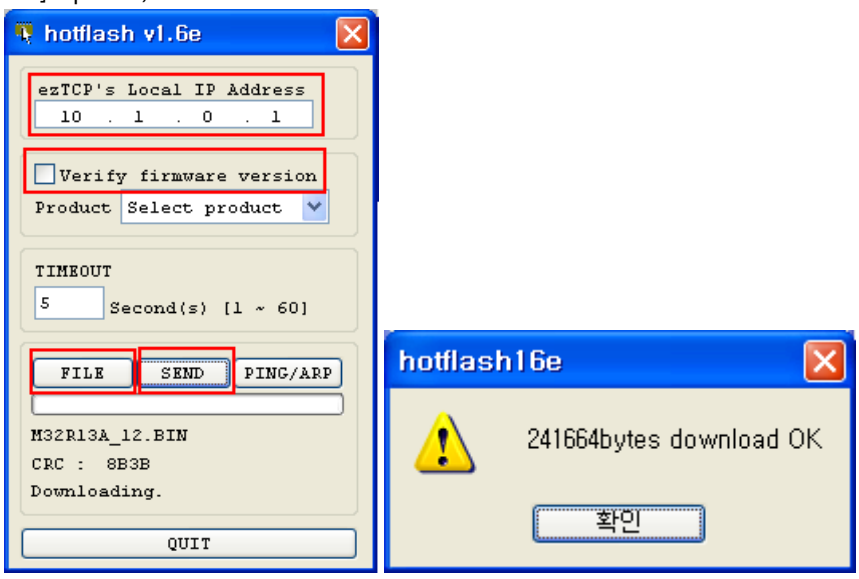
Serial Configuration	Pressing the ISP button for 20ms~1s.	Configuring CSE-H21 through COM1	115200bps/N/8/1
ISP	Pressing the ISP button over 1 second	Firmware download mode All security functions are diabled	115200bps/N/8/1

4.2 Upgrading Firmware

In ISP mode, you can download a firmware (CSE-H21 operation software) provided by our company. There is another thing in this mode. If you forget your password set before, you can reset it by entering this mode. In ISP mode, all the security options including ezTCP firewall are removal.

The following is the firmware downloading procedure.

- Supply power with pressing ISP button or push the button over 1 second, then CSE-H21 operates in the ISP mode.
- Run hotflash that is supplied by us and input IP address of CSE-H21 and select the firmware with the [FILE] menu. Then, send it with [SEND] button. (Uncheck the [Verify firmware version] option.)



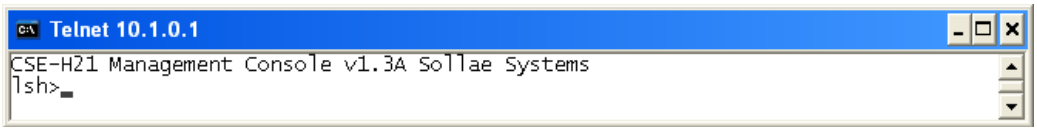
- When the downloading is completed, CSE-H21 automatically reboots and enters normal mode.

☞ *Firmware download can be implemented with ezManager whose version is 3.0A or subsequent version.*

4.3 Checking current status

4.3.1 Telnet login

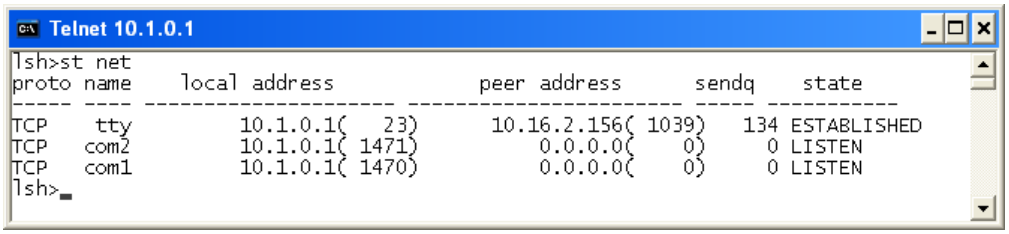
You can log in the CSE-H21 if you enable the [Telnet option] in the [OPTION] tab of the ezManager. Then you can check the network and serial status after logging in the CSE-H21. If you press "telnet [CSE-H21's IP address]" on the command prompt of Windows, you can log in CSE-H21



4.3.2 Commands

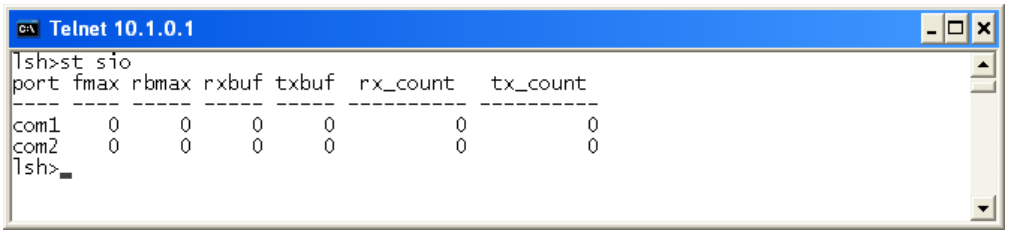
- Network Status

  User can monitor network status of CSE-H21 with the "st net" command.


Telnet 10.1.0.1
lsh>st net
proto name local address peer address sendq state
TCP tty 10.1.0.1(23) 10.16.2.156(1039) 134 ESTABLISHED
TCP com2 10.1.0.1(1471) 0.0.0.0(0) 0 LISTEN
TCP com1 10.1.0.1(1470) 0.0.0.0(0) 0 LISTEN
lsh>

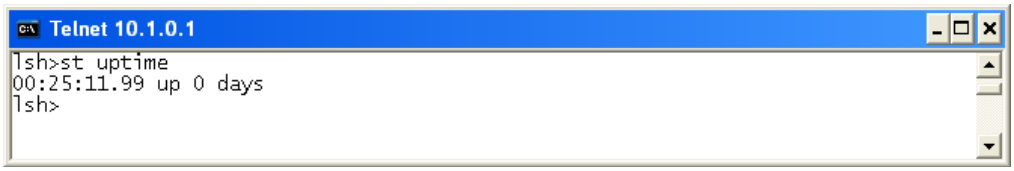
- Serial Ports' Status

  User can monitor the statuses of two serial ports with the "st sio" command. The tx_count and the rx_count are the total data sizes to/from the serial ports.



- Checking Uptime

  With "st uptime" command, you can check the time of your device boots up.



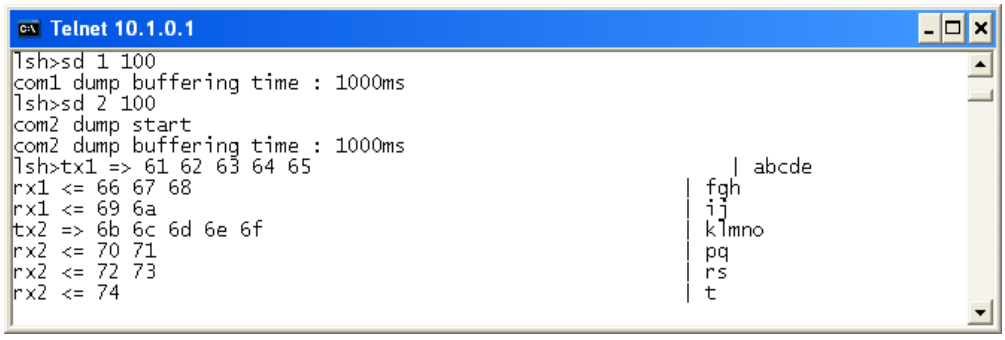
- Serial Ports I/O data capture

  This command is available on 1.2H or subsequently released firmware version. User can monitor the input / output data of CSE-H21's serial ports with the "sd" command. The way of using this command is like below.

"sd [SPACE] [# of Serial Port] [SPACE] [Interval]"

The value of [# of Serial Port] is that COM1 is "1" and COM2 is "2". [Interval] means duration of capturing and printing data on your screen and its unit is mille second (ms).

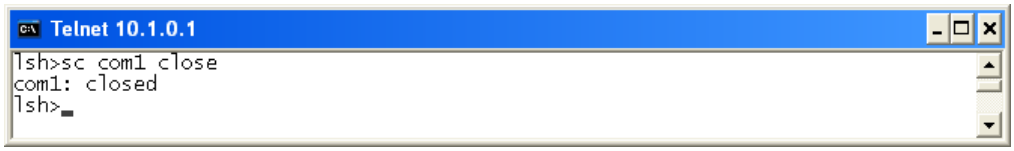
For example, if you want to capture the data in every second, the value of [Interval] should be 100.


Telnet 10.1.0.1
lsh>sd 1 100
com1 dump buffering time : 1000ms
lsh>sd 2 100
com2 dump start
com2 dump buffering time : 1000ms
lsh>tx1 => 61 62 63 64 65 | abcde
rx1 <= 66 67 68 | fgh
rx1 <= 69 6a | ij
tx2 => 6b 6c 6d 6e 6f | klmno
rx2 <= 70 71 | pq
rx2 <= 72 73 | rs
rx2 <= 74 | t

- Termination of TCP connection

  Using "sc" command, users can terminate established TCP connection. The way of using this command is like below.

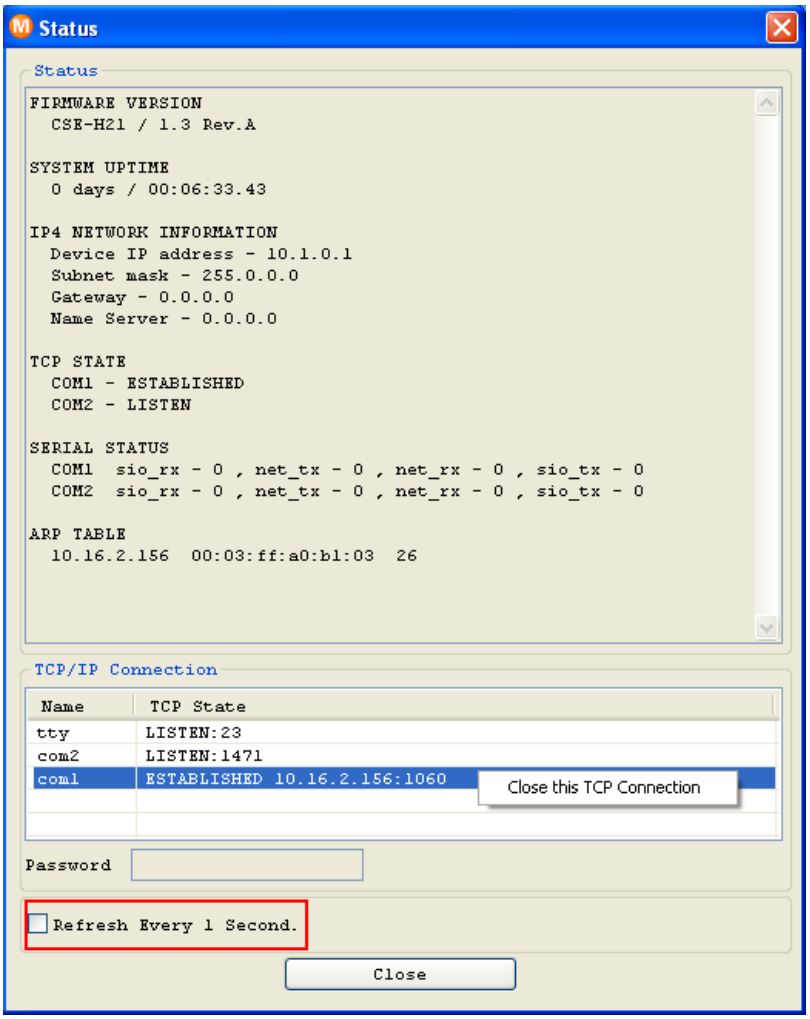
  "sc [SPACE] [Name of Serial Port] [SPACE] close"



4.4 Check Status in the ezManager

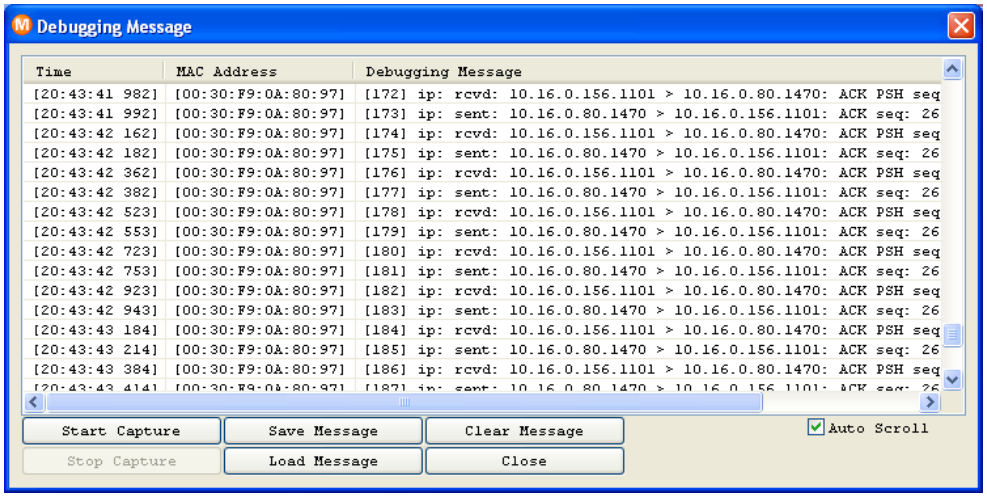
If you press the [STATUS] in the ezManager, you can monitor the current status of CSE-H21. If user sets [Refresh Every 1 second] option, the status data will be updated in every second.

And user can close the TCP connection in the TCP/IP Connection window with mouse-right button.



4.5 Remote Debugging

If the [Debugging Message] field in the [OPTION] tab of the ezManager, CSE-H21 transmits debugging messages with UDP port 50006. Then user can get the messages with new window if user presses [Debugging Message] button as followed:



This function is very useful when there are any problems when users install the CSE-H21 in the user site.

5 Communication Mode

5.1 Introduction

Normal communication mode is suitable for the purpose of using CSE-H21.

Normal communication mode can be classified into four modes – T2S, ATC, COD, and U2S – each of which is described in the following table.

Table 5-1 Communication Mode

Communication Mode	Protocol	Connection	Need for user Equipment Software Modification	Configuring environmental variable via serial port	Topology
T2S	TCP	Passive	Not needed	Impossible	1:1
ATC	TCP	Active Passive	Needed	Possible	1:1
COD	TCP	Active	Not needed	Impossible	1:1
U2S	UDP	No Connection	Not needed	Impossible	N:M

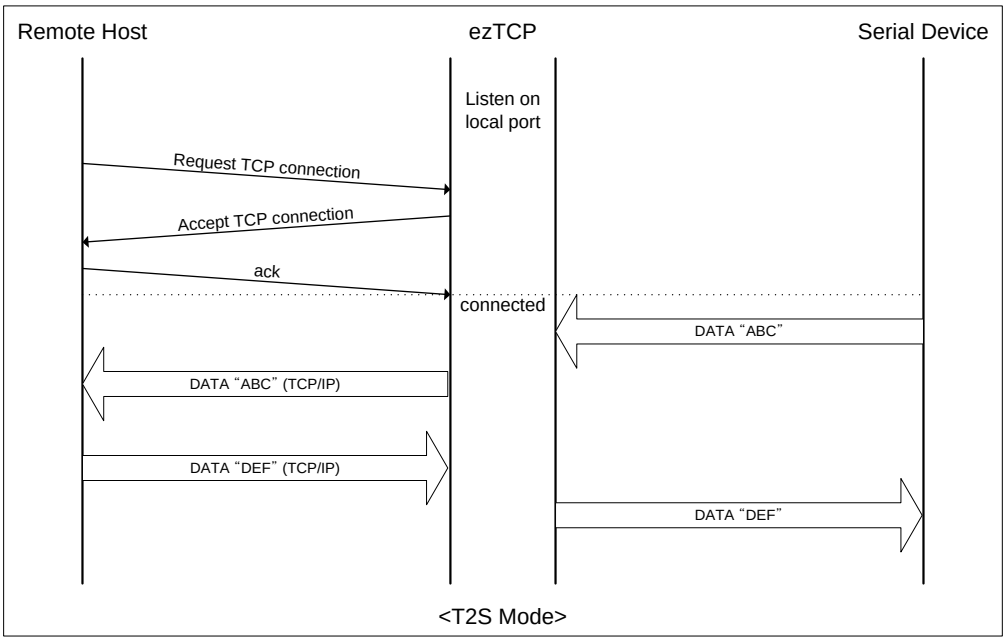
TCP protocol requires connection process. The connection is always established as 1:1 connection. At this time, the host waiting for connection (passive connection) is called a server and the one attempting to connect (active connection) is called a client.

On the other hand, UDP communicates by block unit without connection process. As UDP does not require connection, numbers of hosts can communicate at the same time.

5.2 T2S – TCP Server

In T2S mode, the CSE-H21 functions as a server.

When a host connects to predefined local port, the CSE-H21 accepts a TCP connection. When the ezTCP accepts TCP connection, then the TCP connection is established. After connection is established, TCP/IP processing is performed on the data coming to the serial port, which is then transmitted to the remote host. And the TCP/IP data coming from the remote host is TCP/IP-processed and transmitted to the serial port to establish data communication.



5.2.1 TCP Connection

If a host connects to the pre-defined [Local Port] of CSE-H21, the host can communicate bi-directionally.

5.2.2 Serial Data before the TCP Connection

The received serial data before the TCP connection is established will be handled based on the [Event Byte] settings. If the [Event Byte] is 0, the data that comes to serial port of CSE-H21 will not be recognized. If it is not 0, the serial data before TCP connection will be temporarily saved to be sent to the host after the connection.

5.2.3 Data Transmission

When the TCP connection is established, the data communication in between the host and the serial device will be established. Then, CSE-H21 will send data according to the [Data Frame]. In other words, when the data comes through CSE-H21's serial port, it will

be temporarily saved in the buffer. Then, when there is no incoming data during the designated [Data Frame], CSE-H21 will send the saved data. If the [Data Frame] is 0, CSE-H21 will send serial port's data immediately. The unit used for the [Data Frame] is 10m seconds, so CSE-H21 rounds down rest of the values.

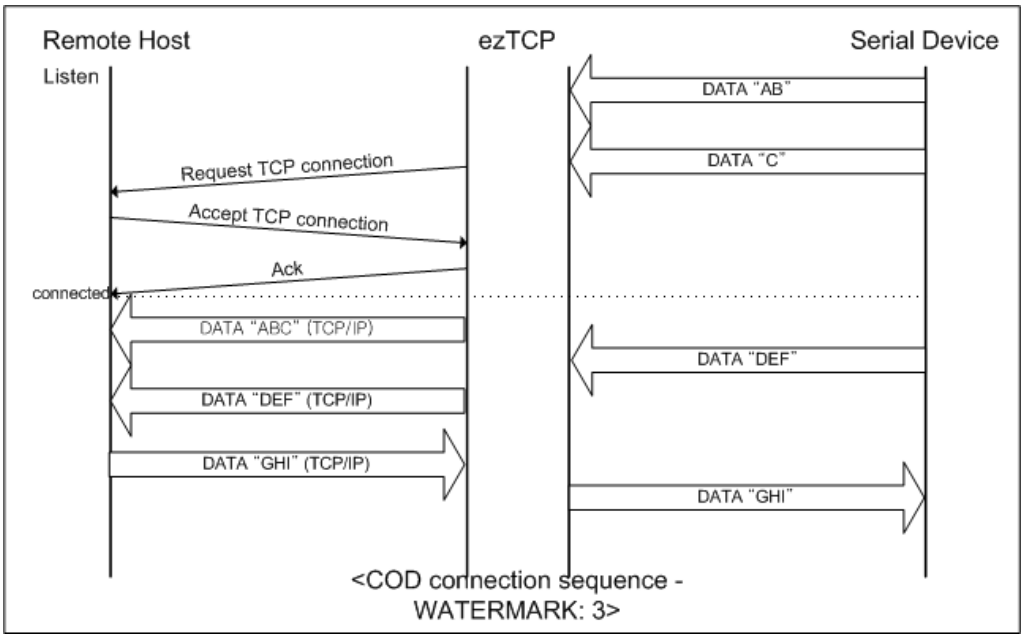
5.2.4 Disconnection

When the connected host terminates the connection, or there is no data communication during the designated [Timeout], the TCP connection will be automatically terminated. The unit used for [Timeout] is 1 second.

5.3 COD – TCP Client

In COD mode, the ezTCP functions as a client.

When data of the pre-specified size [Event Byte] comes to the serial port, the ezTCP attempts a TCP connection to the TCP port [Peer Port] of the preset host IP [Peer IP Address]. If the remote host accepts the TCP connection, TCP connection will be established. Data coming to the serial port after connection establishment is TCP/IP-processed and transmitted to the remote host. And, data coming from the remote host is TCP/IP-processed and transmitted to the serial port for data communication.



5.3.1 Serial Data before the TCP Connection

Data before TCP connection will be handled based on the [Event Byte] settings. If the [Event Byte] is 0, the data that comes to CSE-H21's serial port will not be recognized. If it is not 0, the serial data before TCP connection will be temporarily saved to be sent to the host after the connection.

5.3.2 Data Transmission

When the TCP connection is established, the data communication in between the host and the serial device will be established. Then, CSE-H21 will send data according to the [Data Frame]. In other words, when the data comes through CSE-H21's serial port, it will be temporarily saved in the buffer. Then, when there is no incoming data during the designated [Data Frame], CSE-H21 will send the saved data. If the [Data Frame] is 0, CSE-H21 will send serial port's data immediately. The unit used for the [Data Frame] is 10

milliseconds, so CSE-H21 rounds down rest of the values.

5.3.3 Disconnection

When the connected host terminates the connection, or there is no data communication during the designated [Timeout], the TCP connection will be automatically terminated. The unit used for [Timeout] is 1 second.

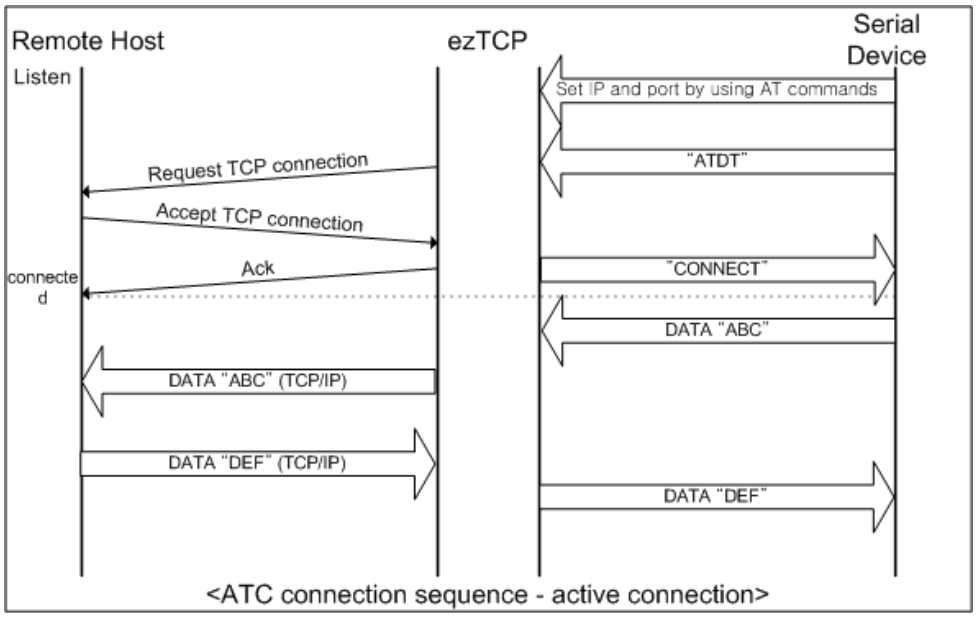
5.3.4 DNS

If users set the host name instead of the IP address on the [Peer Address] box, CSE-H21 query the IP address of the host to its Domain Name Server (DNS). The IP address of DNS can be configured on ezManager. If you set incorrect address on that box, the connection won't be established.

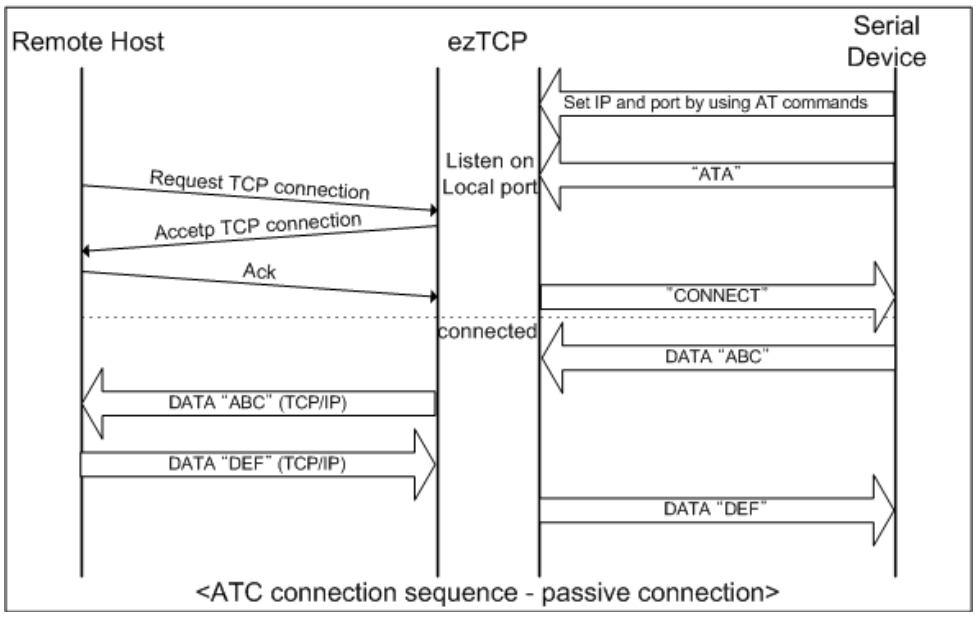
5.4 ATC – AT Command

In ATC mode, the user can control the CSE-H21 in a similar way to controlling the modem using AT command. In ATC mode, only a TCP connection is possible and both the server and the client can be configured.

In ATC mode, the AT command allows the user to set environment variables including the IP address and control TCP connection and disconnection.



<ATC connection sequence - active connection>



<ATC connection sequence - passive connection>

☞ *For detailed information on AT commands, please refer to the "7. ATC mode".*

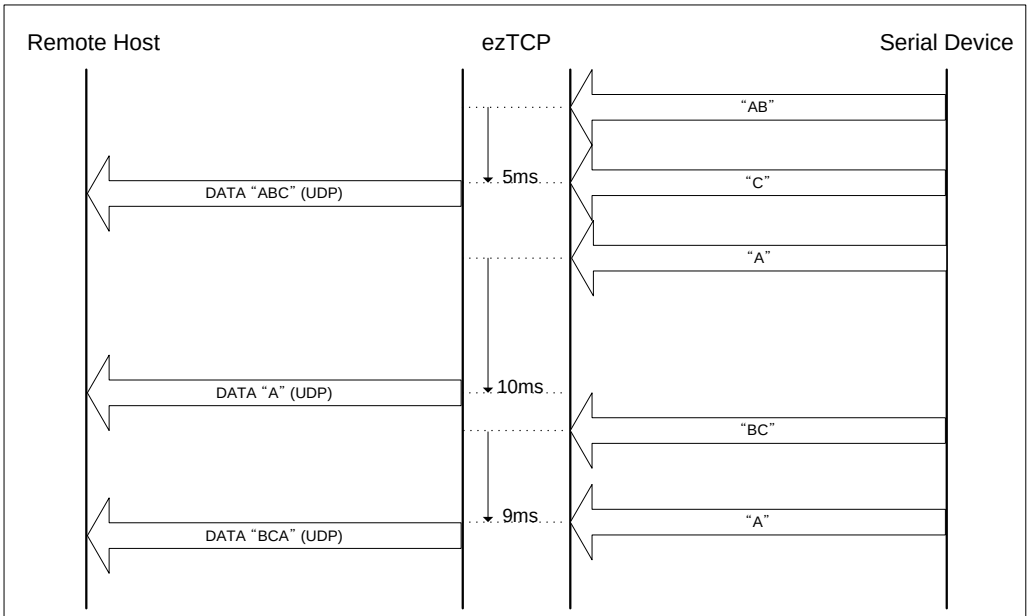
5.5 U2S – UDP

U2S is a mode that performs UDP communication.

In UDP communication, data is sent in block units. Therefore, data that comes through CSE-H21's serial port must be classified in block units to send it elsewhere. The block unit classification process is performed as the following.

When the amount of received data via CSE-H21 serial port is as same as previously designated data Event Byte, [Event Byte], or the duration of the data exceeds [Data Frame], the incoming data will be recognized as one block. This block will be sent to UDP. [Timeout] is in 10ms.

Since UDP communication does not involve establishing connection, N: M communication may be performed using broadcast. Therefore, it can be conveniently in changing RS 485 multi drop type network to Ethernet.



<U2S Transmission sequence – Byte Count:3, Guard Time: 1>

In addition, if the [Peer Address] and [Peer Port] are set to 0, U2S echo functions will be applied. This option allows it to send UDP packets according to the source IP address in the last packet which is received. By using this, CSE-H21 can send multiple hosts one by one. This function is available on 1.2H or subsequently released firmware version.

6 ATC Mode

6.1 Overview

CSE-H21 can be controlled by AT commands in ATC mode. For example, the peer host IP address can be set by AT+PRIP command and connect to the host by ATD command.

Therefore, CSE-H21 communicates several hosts alternatively.

And also, it provides passive connection function by ATA command.

6.1.1 AT command format

AT commands start with AT, and end <CR>.

AT command format is followed.

AT	Command	<CR>(0x0d)

The response code to AT command is followed.

<CR>(0x0d)	<LF>(0x0a)	Response message	<CR>(0x0d)	<LF>(0x0a)

Response Message

When ATV1 (initial setting)	When ATV0	Description
OK	0	command OK
CONNECT	1	TCP connected
NO CARRIER	3	TCP disconnected
ERROR	4	Command error
Set value	Set value	When query set value (example: AT+PRIIP?)

6.2 Basic AT Command Set (Example: ATA, ATD etc.)

Command	Function	Description
A	passive connection	Listen connection (host → CSE-H21 connection)
D	active connection	Connecting to host form CSE-H21
E	echo	Echo (E0 – no echo, E1-echo)
H	off-hook	disconnection
I	Info	Output CSE-H21 related-information

		ATI3: the firmware version ATI7: MAC address
O	Online	To online mode
V	enable result code	Result code (numeric-V0, alphabetic-V1)
Z	reset	Reset

6.3 Extended AT Commands (Example: AT+PLIP etc.)

Command	Function	Description
+PLIP	local IP address	Needed AT+PWP after setting this parameter
+PSM	subnet mask	
+PGIP	default router	
+PLP	listening TCP port	
+PTO	timeout	
+PRIP	Remote machine IP address	
+PNIP	Name Server IP address	Setting the name server IP
+PRHN	Remote host name	Setting the peer host name to connect with double quotation. (at+prhn="www.sollae.co.kr") After setting this parameter, CSE-H21 queries the IP address according to the name, and set the IP address to the +PRIP parameter.
+PRP	Remote machine TCP port	
+PWP	Write configuration	Saving and Reset
+PARP	ARP setting function enable/disable	ON: 1, OFF: 0
+PDC	DHCP enable/disable	ON: 1, OFF: 0
+PSE	"+++" data transmission enable/disable when turn to AC command state	ON: 1, OFF: 0

6.4 Online State and AT Command State

It is AT command mode during disconnected. AT commands can be used in AT command mode. After TCP connection (Online Mode), AT commands cannot be used. To use AT commands during the connection, change state to AT command state.

AT Command State	During TCP disconnected, AT commands can be used To use AT commands during the connection, required escape sequence
Online State	During TCP connected, all serial data to CSE-H21 convert TCP and send to Ethernet

6.4.1 Changing Online State to AT Command State

To change online state to AT command state during the connection(Online State), +++ string should be transmitted to CSE-H21 as following time interval.

When transmitting +++ string to CSE-H21, +++ string will be sent to peer host.

The time from final data the first '+' data of '+++' string	No data over 500ms(guard time)
time intervals between '+'s	0~500ms
Time interval after receiving last '+'	No data over 500ms (guard time)

☞ *In case of 1.3A or subsequent versions of F/W, users can select whether "+++" data is transmitted or not by using AT+PSE command.*

6.4.2 Changing AT Command State to Online State

If CSE-H21's state is in AT command state during TCP connection, CSE-H21's state can be changed into online state by an ATO command.

6.5 Example of Configuration with AT Command

	Serial Port		Description
	AT+PLIP=192.168.1.200<CR>	▶	Setting LOCAL IP address
◀	<CR><LF>OK<CR><LF>		Command OK
	AT+PGIP=192.168.1.254<CR>	▶	Setting GATEWAY IP address
◀	<CR><LF>OK<CR><LF>		Command OK
	AT+PSM=255.255.255.0<CR>	▶	Setting SUBNET MASK
◀	<CR><LF>OK<CR><LF>		Command OK
	AT+PLP=1470<CR>	▶	Setting LOCAL PORT
◀	<CR><LF>OK<CR><LF>		Command OK
	AT+PTO=10<CR>	▶	Setting TIME OUT

◀	<CR><LF>OK<CR><LF>		Command OK
	AT+PWP<CR>	▶	Saving setting value to EEPROM Reset automatically
◀	<CR><LF>OK<CR><LF>		Command OK
◀	<CR><LF>NO CARRIER<CR><LF>		System Reset

6.6 Example of TCP Connection

6.6.1 Example of Active Connection

	Serial Port		Description
	AT+PRIP=192.168.1.201<CR>	▶	Setting remote IP address to connect
◀	<CR><LF>OK<CR><LF>		Command OK
	AT+PRP=1470<CR>	▶	Setting remote port number to connect
◀	<CR><LF>OK<CR><LF>		Command OK
	ATDT<CR>	▶	Connecting to the host
Attempting to connect to the host			
◀	<CR><LF>CONNECT<CR><LF>		TCP connection success
Data Communication			

6.6.2 Example of Active Connection with host name

	Serial Port		Description
	AT+PNIP=168.126.63.1<CR>	▶	Setting the name server's IP address to connect
◀	<CR><LF>OK<CR><LF>		Command OK
	AT+PRHN="www.sollae.co.kr"<CR>	▶	Setting the host name to connect After this command, CSE-H21 query the host name to the name server. After getting the IP address, it sets to the +PRIP parameter.
◀	<CR><LF>OK<CR><LF>		Command OK
	AT+PRP=1470<CR>	▶	Setting remote port number to connect
◀	<CR><LF>OK<CR><LF>		Command OK
	ATDT<CR>	▶	Connecting to the host

Attempting to connect to the host			
◀	<CR><LF>CONNECT<CR><LF>		TCP connection success
Data Communication			

☞ *When being established the active TCP connection, the [Local] Port number may be changed to temporary values.*

6.6.3 Example of passive Connection

	Serial Port		Description
	AT+PLP=1470<CR>	▶	Set LOCAL PORT to listen
◀	<CR><LF>OK<CR><LF>		Command OK
	ATA<CR>	▶	Passive connection command
Listen on local port from a host			
A host connects to CSE-H21			
◀	<CR><LF>CONNECT<CR><LF>		TCP connection OK
Data Communication			

6.7 Example of TCP Disconnection

6.7.1 Example of active disconnection

CSE-H21 disconnects the connection.

	Serial Port		Description
Data Communication(during TCP connection)			
	[Data Frame]+++[Data Frame]	▶	Changing online state to AT command state
◀	<CR><LF>OK<CR><LF>		Changed to AT command state
	ATH<CR>	▶	TCP disconnection command
◀	<CR><LF>OK<CR><LF>		Command OK

6.7.2 Example of passive disconnection

The remote host disconnects the connection.

	Serial Port		Description
Data Communication(during TCP connection)			
The remote host disconnect the connection			
◀	<CR><LF>NO CARRIER<CR><LF>		TCP disconnected

7 Security Protocols & Option

7.1 SSL

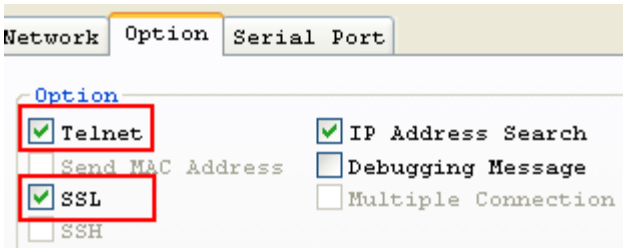
7.1.1 SSL (Secure Socket Layer)

SSL is cryptographic protocol that provides secure communication on the Internet. The SSL works over TCP.

7.1.2 How to set the SSL on CSE-H21

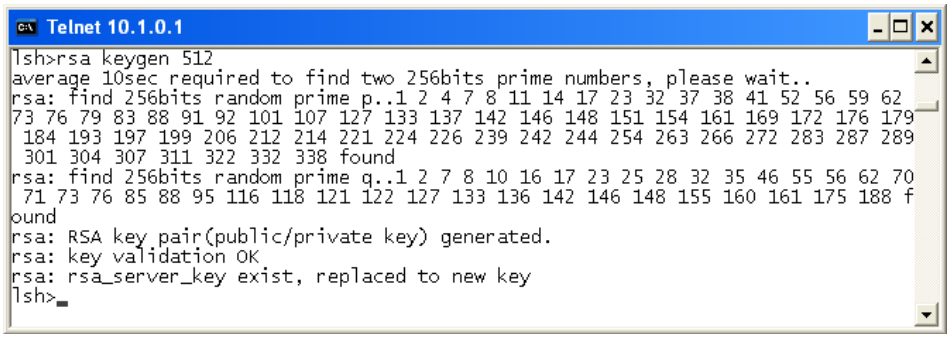
To works for SSL, you have to set the SSL-related parameters as the following steps.

- Set the [SSL] check box in the ezManager.

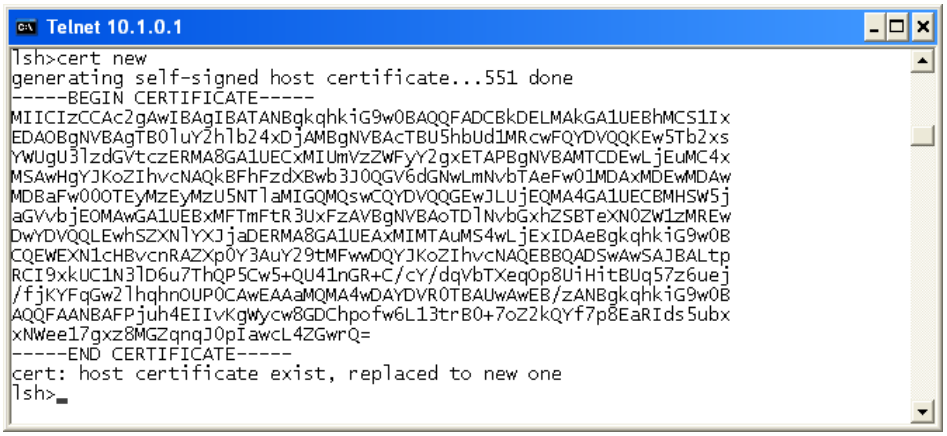


- Log in the CSE-H21 with telnet client.
- Generate an RSA key with a command. CSE-H21 supports 512, 768, and 1024 length keys.

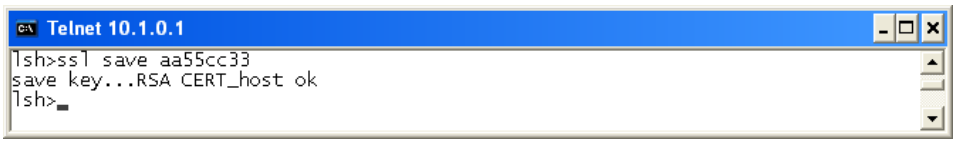
Command Format: rsa keygen [key length]



- Make a certificate with a 'cert new' command. The certificate is a self signed.



- Save the parameters for SSL with a 'ssl save aa55cc33' command.



7.1.3 Restriction

To use the SSL with CSE-H21, there is a restriction. You can use only one serial port (COM1) if you set the SSL function.

7.2 SSH

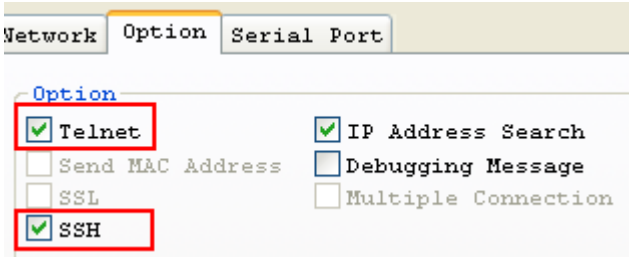
7.2.1 SSH (Secure Shell)

SSH is a network protocol that allows secure communications between two devices. You can use this function if your device is a serial port for console and you need secure communication.

7.2.2 How to set the SSH on CSE-H21

To works for SSL, you have to set the SSH-related parameters as the following steps.

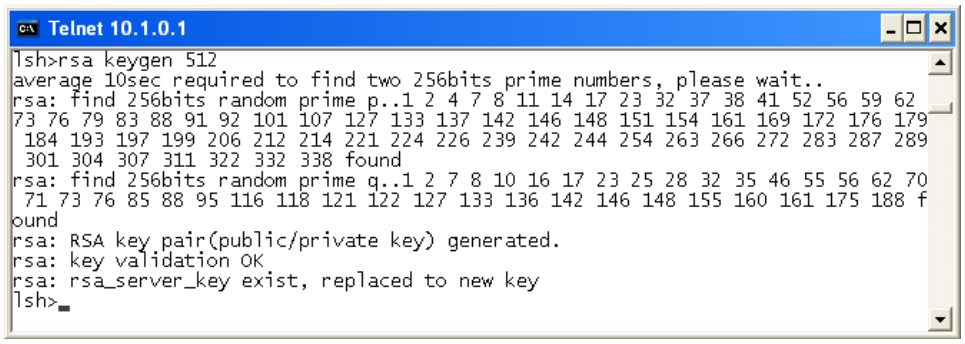
- Set the [SSH] check box in the ezManager.



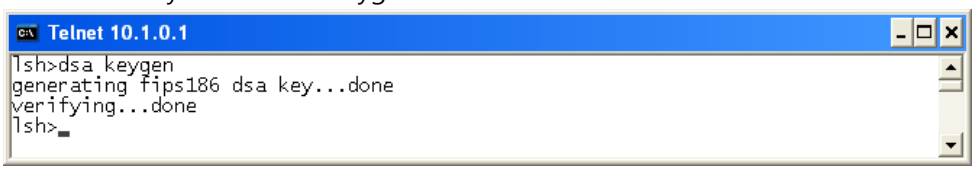
- Log in the CSE-H21 with telnet client.
- Generate an RSA key with a command. CSE-H21 supports 512, 768, and 1024 length

keys.

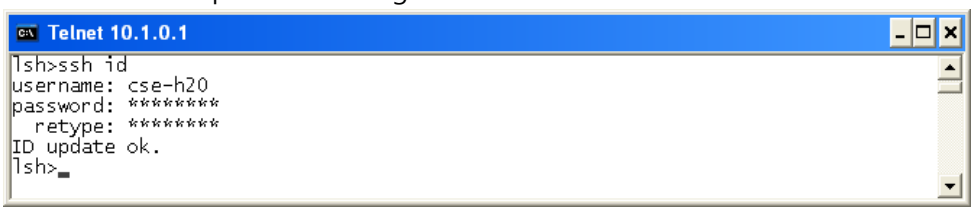
Command Format: rsa keygen [key length]



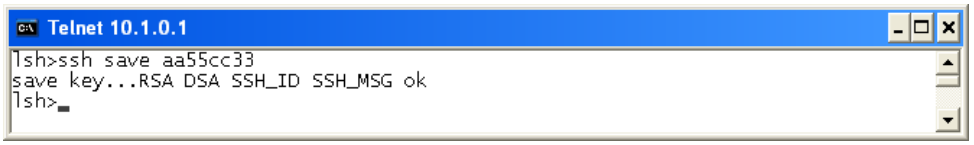
- Generate a DSA key with a 'dsa keygen'.



- Set a username and a password to log in with a 'ssh id' command for the SSH.



- Save the parameters for SSH with a 'ssh save aa55cc33' command.

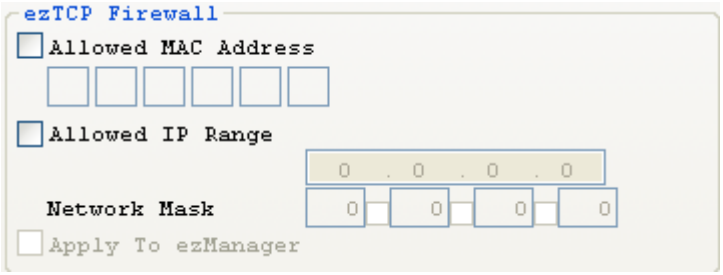


7.2.3 Restriction

To use the SSH function with CSE-H21, there is a restriction. You can use only T2S mode (TCP Server mode) if you set the SSH function

7.3 ezTCP Firewall

CSE-H21 has two connection limitation functions. Those can be set by the [Option] tab of the ezManager.



- Allowed MAC Address

  If user sets the [Allowed MAC Address], the only specified host can be connected with the CSE-H21.

- Allowed IP Range

  When the [Allowed IP] is set, the only hosts that are specified by [Allowed IP] and [Network Mask] can connect to the CSE-H21.

- examples

Allowed IP	Net Mask	Hosts who can connect to the CSE-H21
10.1.0.1	255.0.0.0	10.1.0.1 ~ 10.255.255.254
10.1.0.1	255.255.255.0	10.1.0.1 ~ 10.1.0.254
192.168.1.4	255.255.255.255	192.168.1.4

- Apply to ezManager

  If this option is checked, hosts who are not specified above two restrictions can't search and configure CSE-H21 with ezManager. This is enabled when one of restrictions is set at least.

☞ *All security functions are disabled in the ISP mode. So user can access the CSE-H21 in the ISP mode even though user can't access the CSE-H21 in the normal mode because of the [ezTCP Firewall] function.*

8 Technical Support, Warranty, and Notes on Operation

8.1 Technical Support

If you have any question regarding operation of the product, visit Customer Support FAQ corner and the message board on Sollae Systems' web site or send us an email at the following address: support@eztcp.com

Website Address for Customer Support:

http://www.eztcp.com/en/Support/support.php

8.2 Warranty

8.2.1 Refund

Upon the customer's request to refund the product within two weeks after purchase, Sollae Systems will refund the product.

8.2.2 Free Repair Services

For product failures occurring within one year after purchase, Sollae Systems provides free repair services or exchange the product. However, if the product failure is due to user's fault, repair service fees will be charged or the product will be replaced at user's expense.

8.2.3 Charged Repair Services

For product failures occurring after the warranty period (one year) or resulting from user's fault, repair service fees will be charged and the product will be replaced at user's expense.

8.2.4 Notes on Operation

- Sollae Systems is not responsible for product failures occurring due to user's alternation of the product.

- Specifications of the product are subject to change without prior notice for performance improvement.

- Sollae Systems does not guarantee successful operation of the product if the product was used under conditions deviating from the product specifications.

- Reverse engineering of firmware and applications provided by Sollae Systems is prohibited.

- Use of firmware and applications provided by Sollae Systems for purposes other than those for which they were designed is prohibited.

- Do not use the product in an extremely cold or hot place or in a place where vibration is severe.

- Do not use the product in an environment in which humidity is high or a lot of oil exists.

- Do not use the product where there is caustic or combustible gas.

- Sollae Systems does not guarantee normal operation of the product under the conditions a lot of noise exists.

- Do not use the product for a purpose that requires exceptional quality and reliability relating to user's injuries or accidents – aerospace, aviation, health care, nuclear power, transportation, and safety purposes.

- Sollae Systems is not responsible for any accident or damage occurring while using the product..

9 Revision History

Date	Version	Comments
Jun. 03. 2008	1.0	Initial Release
Aug. 01. 2008	1.1	Add SSL and SSH functions Add WEEE notation
Dec. 04. 2008	1.2	Modify ISP button function Add AT+PNIP, AT+PRHN Add Connect with a host name in ATC Mode Add Close TCP function
Jan. 07. 2009	1.3	Add security function in the ISP mode
Mar. 04. 2009	1.4	Add description of serial I/O data capture by using telnet.(sd command) Add description of U2S echo Correct Some Expressions
Mar. 31. 2009	1.5	Modify the table of 1.4.2 Modify the table of 6.7.1 Correct Some Expressions Modify 8.1 Technical Support
Apr.22.2009	1.6	Modify the table of 1.4.2
Jul.13.2009	1.7	Add description of Send MAC Address function Add description of AT+PSE command Add description of changing local port in ATC mode Add description of Termination of TCP connection in TELNET Update most of pictures including ezManager and Telnet Modify the 3.2 Configuration with ezManager Modify the description about F/W upgrade Modify the 3.6 Notify IP change Change the form of document Correct some expressions